

**NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, DC 20594**

**HUMAN PERFORMANCE
SUB-GROUP CHAIRMAN'S FACTUAL REPORT –
SONAR & FIRECONTROL**

AUG 13, 2002

Revise September 27, 2002

A. ACCIDENT

Accident No.	DCA01MM022
Vessels Involved:	USS <i>GREENEVILLE</i> & MV <i>EHIME MARU</i>
Location:	About 9 miles south of Oahu, Hawaii Lat 21° 04.5' N Long 157° 49.5' W
Date:	February 9, 2001
Time:	1343 HST ¹

B. OPERATIONS/HUMAN PERFORMANCE GROUP (Sonar and Firecontrol Sections)

Tom Roth-Roffy, NTSB, Operations Group Chairman
Bill Woody, NTSB, Human Performance Specialist
Barry Strauch, NTSB, Human Performance Specialist
Capt. Tom Kyle, US Navy (Coordinator)
Commander John Caccivio, US Navy
LT Commander Rick Santomauro, US Navy
LT Charlie Johnson, US Coast Guard
LTJG Ken Kusano, US Coast Guard

C. SUMMARY

On February 9, 2001, at 1343 local time, the USS *GREENEVILLE*, (SSN 772), a Los Angeles class submarine, collided with the Japanese Motor Vessel, *EHIME MARU*, about 9 miles south of Oahu, Hawaii. The *EHIME MARU*, which engaged in teaching Japanese high school students the fishing trade, was proceeding on course 166° at 11 knots, en route to a fishing area. The *GREENEVILLE* was engaged in a distinguished visitor cruise, a Navy program that invites civilians to observe actual operations aboard its vessels. The *GREENEVILLE* struck the *EHIME MARU* as it completed an emergency-surfacing maneuver from a depth of about 400 feet. The *EHIME MARU* was critically damaged and sank as a result of the collision. Thirty five people were onboard the *EHIME MARU*. The bodies of eight people were found when the vessel was retrieved from the ocean floor. A ninth victim remains unaccounted

¹ All times are in Hawaiian Standard Time as read on a 24-hour clock, unless specifically noted.

for. The *GREENEVILLE* was damaged but was able to return to Pearl Harbor under its own power. There were no injuries to any of the persons on board.

D. CREW INFORMATION – *EHIME MARU* WATCH SECTION

Crewmembers on the *EHIME MARU*, with the exception of the contract unlicensed deck force, were employees of the Unajima Fisheries High School. The Master and 2 Deck Officers stated that they held licenses issued by the government of Japan. The Master stated that he held a level 4 (5 is highest) and the 2 Deck Officers held level 3 licenses. The licenses were lost with the vessel. The Master, age 58, had sailed for 40 years after graduating from high school. He spent 19 years sailing aboard commercial fishing vessels and 21 years sailing on various generations of the *EHIME MARU* (#s 2, 3, and 4). He sailed master for the last 8 years and has been the master of *EHIME MARU* (# 4) since it was commissioned in 1996. The Master was the navigation watch officer when the vessel departed Honolulu and was still on watch when the collision occurred. Also on the bridge at the time of the collision were two unlicensed seaman, ages 52 and 59, acting as lookouts and messengers. At the time of the collision there were three crewmembers in the engineering control room, the Chief Engineer, First engineer, and First Oiler. The First Oiler, age 22, was a recent graduate of the Unajima Fisheries High School and was on his first sea voyage as a crewmember. He had taken marine engineering courses in high school and was in a student engineering position on the *Ehime Maru* under the tutelage of the Chief and First Engineers. The Chief and First Engineers did not survive the sinking of the *EHIME MARU*.

The vessel had been in port in Honolulu for 3 days for provisioning and shore leave. The Master stood no in port watches during this time and the other deck watchstanders stood a single 3 hour watch while in port. The Master and the other 2 deck officers stated that they had adequate sleep in port and were well rested when the vessel proceeded to sea at approximately 1200 on Friday, February 9, 2001.

E. GENERAL CREW INFORMATION – *USS GREENEVILLE*

Nineteen (19) Crewmembers from the *USS GREENEVILLE* were interviewed in Pearl Harbor. The ship had been in port since Friday, February 3, 2001 and all crewmembers, except the Commanding Officer (CO) and the Officer of the Deck (OOD), reported being well rested. All of those interviewed, except the CO, OOD, and firecontrol technician on watch, provide a 72-hour history form providing details of the activities and rest periods. This form, produced by the *USS GREENEVILLE* Executive Officer greatly reduced interview time and is gratefully acknowledged.

F. *USS GREENEVILLE* WATCH BILLS for MANEUVERING and UNDERWAY WATCHES

The *GREENEVILLE* had left about a third of the crew in port for training and planned to carry more than sufficient personnel for the expected one-day cruise. The Command had organized a maneuvering watch for getting underway and returning to port and an underway watch setup for the at-sea portion of the cruise, that ensured properly qualified personnel were at all key watch stations, except for an unqualified watchstander in sonar. (The role of the unqualified sonar watchstander is discussed in the sonar section.) The underway watch had the crew organized into two shifts, or watch sections. The first watch section started at the cessation of the maneuvering watch, about 0851 until about 1140 and the second watch from about 1140 until the maneuvering watch would be set for entering port. Some extra personnel were carried and assigned to clean-up details, which provided additional personnel to care for the distinguished visitors and extra personnel for additional duties, as required. However, some persons would be on watch longer than others as was the case with the sonar supervisors. Also the sonar watch assignments did not include a fathometer watchstander that was required while submerged due to close proximity to land.

G. SONAR

Petty Officer Edward W. McGiboney, Sonar Technician First Class (STS1), the Sonar Supervisor at the time of the accident, had seven years of sea duty as a sonar technician. He was qualified in submarines and had served as a sonarman on two previous submarines, and had been on the *GREENEVILLE* for 3 1/2 years. He had been qualified to stand sonar supervisor watches for 3 years on *GREENEVILLE* and for one year aboard his previous submarine. He regularly stood sonar supervisor watches underway. Also he stood watch as Chief of the Watch underway and duty chief in port. Whenever his submarine was in port for extended periods, he, like other sonar supervisors, took training at shoreside training facilities about every month to maintain his qualification as a sonar supervisor.² He participated in training on board ship and he was involved in the training of the junior sonar technicians.

When the *GREENEVILLE* got underway on February 9, Petty Officer McGiboney was topside where he supervised the release of Number one mooring line. Then he was involved in securing the deck for going to sea, which involved stowing all equipment and ensuring that there were no loose fittings that could vibrate or make noise. He estimated that his topside duties were

² Qualification in Submarines and qualification as sonar operator on specific equipment, sonar supervisor, and chief of the watch required that the person seeking such qualification complete a number of prescribed tasks that were listed on a qualification card for the particular qualification. Normally such tasks involved completion of numerous practical factors including standing a certain number of watches under instruction. Once all qualification factors were completed a board of officers and senior petty officers examined each candidate.

completed and that by 0900 to 0930 he was in sonar assisting with explaining sonar to the distinguished visitors. He stated that one of the sonar recorders was being used to play a tape recording of fish noises to demonstrate to the visitors how the sea sounds to a sonar technician. The recorder used for this purpose was normally operated continuously to record conversations in sonar and the sound of sonar contacts. About 1130 he left sonar to have lunch and then returned to sonar to relieve the sonar supervisor. Petty Officer McGiboney continued on watch as the sonar supervisor until relieved by the other sonar supervisor shortly after the collision.

Petty Officer McGiboney, as the sonar supervisor, was in charge of two other sonar watchstanders: (1.) A broadband stack (consol) operator who was primarily responsible for detecting and tracking sonar contacts, and (2.) A workload share stack operator, who was responsible for determining screw blade information³ of the sonar contacts and for assisting the broadband operator in tracking contacts in the event there were numerous contacts.

The Chief Petty Officer, in charge of sonar had failed to recognize that the ship would be operating close enough to land to require a sonarman on the fathometer while submerged and this required changing the watch bill after the ship was under way to station a qualified sonar technician on the fathometer. Another sonar technician, Petty Officer Bowie, who was not on the watch bill but was qualified to stand watch in sonar, volunteered to take the watch on the broadband stack, and he was then assigned to the broadband watch.

Petty Officer Bowie stated that he had been in the Navy for about a year and a half. He had attended submarine school and sonar class A school. He had been qualified in submarines for eight months and qualified to stand broadband watches for over a year. On the day of the accident he had volunteered to stand watches in sonar as needed starting at 0900 or 0930. (Petty Officer Reyes who was assigned to the first watch on the broadband recalled that Petty Officer Bowie had relieved him at the broadband stack about 1140.) Petty Officer Bowie stated he was well rested and felt fine. He stated that his sonar equipment was operating satisfactory and that he was able to track contacts despite some interference from biologics. He recalled tracking three contacts during his watch S-12, S-13⁴, and S-14, (See Table No. 1.) and that these three contacts were "centered around north" but he had no idea of their range. He stated that the submarine commenced a series of angles followed by high-speed turns. At some after these maneuvers the ship was steadied on course approximately north (probably 340°). He stated that two of the sonar contacts were drawing left and he believed they may have been S-12 and S-13, and that

³ Number of propellers, number of blades on propeller/propellers, and propeller RPM.

⁴ The *Greeneville* is equipped with a Sonar Data Logger (SLOGGER), which captures system data from the sonar and fire control equipment as well as own-ship motion. After the accident the Navy reconstructed the track of the USS GREENVILLE using SLOGGER data, and the track of the M/V *EHIME MARU* using radar data acquired by the Safety Board from the Honolulu Airport. The reconstruction established that S-13 had been the M/V *EHIME MARU*.

S-14 may have been drawing right, but he was not certain. He recalled that the CO came into sonar and asked if sonar had contacts and that the sonar supervisor had said "yes sir" and then explained the contacts. The CO then left sonar and went into control. Soon after the CO left sonar the course was changed to south (probably 120°) for a baffle clear. According to Petty Officer Bowie the XO was in sonar during the baffle clear and that another senior sonarman (Petty Officer Reyes) also was there. He stated that he conducted an acoustic search after the ship steadied on course south and found no other contacts except the three he was tracking: S-12 and S-13, and S-14. This course change, according to Petty Officer Bowie, placed all three sonar contacts (S-12, S-13, and S-14) "right outside the port baffles." He stated that he recalled the Sonar Supervisor report a round of sonar bearings to conn as part of the preparations for going to periscope depth, and that the ship made a normal trip to periscope depth. He remembered hearing the OOD announce no close contacts followed by the ESM operator report no close contacts, and then the sonar supervisor announced no close contacts. He remembered the CO ordering emergency deep and then a little while later ordering the emergency surface, evolutions that he expected to occur. Petty Officer Bowie stated that there were no visitors in sonar when the vessel conducted the baffle clear and proceeded to periscope depth.

Seaman Rhodes, who was assigned the watch on the workload share stack by the watch bill, had been on board the Greenville, his first submarine for six months and this was his second time underway. He had not yet qualified in submarines nor was he yet qualified to stand any of the watches in sonar. At the time, the Plan-of-the-Day listed him as being behind in accomplishing the prescribed tasks for submarine qualification. He was a graduate of sonar Class A school, the primary basic technical training for the sonar technician rating. Petty Officer McGiboney stated that on the *GREENEVILLE* unqualified personnel were permitted to stand sonar watches without an assigned over-instruction watchstander, a normal practice in submarines⁵. He stated that the unqualified watchstander received supervision from the broadband operator and from the sonar supervisor. Petty Officer McGiboney further stated that Seaman Rhodes was competent to change screens on the workload share stack and was competent to determine screw blade information. Petty Officer McGiboney stated that screw blade information was normally obtained, but this information was not coming in on the sonar that day and that Seaman Rhodes did not actually determine any screw blade information.

Seaman Rhodes was also responsible for keeping the log of sonar contacts, which involved recording such information as time, bearing, signal to noise ratio, and classification of each sonar contact. Log entries were made

⁵ At the U. S. Navy Court of Inquiry, the Deputy Chief of Staff for Tactics and Training for SUBPAC stated one observer who rode submarines for training purposes had informed him that the procedure of allowing unqualified sonarmen to stand watch without an assigned over-instruction had been observed about 25 % of the time.

whenever a contact was gained, every 10 to 15 minutes, and when a contact faded or was lost. Petty Officer McGiboney noted that Seaman Rhodes erroneously logged one contact as faded, when in reality it had been lost by being placed in the baffles when the submarine changed course. Seaman Rhodes later stated that no one looked at his log until after the accident when the sonar supervisor, who relieved Petty Officer McGiboney, reviewed it. The XO later stated that reviewing the sonar log was not something he normally did when he visited sonar and that he obtained information on sonar contacts through talking with the sonar watchstanders and by observing the display on the sonar stack. (See Table No. 1 Sonar Contacts.)

Petty Officer McGiboney stated that it was customary practice to rotate the sonar positions about every hour, but this was not possible that day with the reduced number of sonarmen on board, but that the sonar watchstanders were on watch for just over an hour.

Petty Officer McGiboney was not scheduled by the watch bill to assume the watch until later, but he and the other sonar supervisor on board for the one-day cruise had arranged to exchange watches. However, neither supervisor sought or obtained permission from the OOD, a normal procedure when deviating from the published watch bill. Petty Officer McGiboney explained that the other sonar supervisor was assigned to stand the maneuvering watches (watches for departing and entering port) and with his normal underway watch would be on watch for much of the day. By exchanging the watches the other supervisor would have a period of time off watch before he would be required to be on the maneuvering watch for entering port.

The sonar watch bill is prepared by the Chief Sonarman and submitted to the Chief of the Boat (COB). The COB receives the various inputs and prepares the watch bill for the ship. The watchbill is reviewed by the COB, department heads, and the XO, and is then approved by the CO.

He stated that, as was his normal procedure for assuming the sonar supervisor watch, he checked the electronics space to ascertain that power sources to sonar were normal and then received a briefing from the sonar supervisor, whom he was relieving, about sonar detection conditions, condition of equipment, and status of the contacts that sonar then held. He also said that it was normal procedure for the relieving sonar supervisor to review the vessel's position on the chart, but on this occasion he did not do so.

Petty Officer McGiboney stated that sonar conditions above 400 feet appeared to be good for detecting contacts. He recalled two contacts early in his watch: S-10 classified as a light craft and S-11 classified as a merchant ship. Contact S-11 was lost at 1213, and S-10 was lost at 1246 (1245:45). At 1230 sonar gained S-12 bearing 332° and a few minutes later at 1232 sonar gained S-13 bearing 357°. Both of these contacts were classified by sonar as surface

contacts and both were considered to be distant and posing no particular threat. Petty Officer McGiboney stated that he had listened to both S-12 and S-13.

During the early part of his watch, Petty Officer McGiboney recalled that some of the distinguished visitors were still in sonar and that they were being briefed about sonar operations. He stated the sonar recorder was being used to play a tape recording of fish noises for the visitor's information. He said that sometime later, the passengers left sonar to observe evolutions in control and the playing of fish noises was stopped, but he did not think to put the recorder in its normal mode of operation to record conversations in sonar and sonar contacts.

Petty Officer McGiboney stated that sonar's primary responsibility was to detect, track and classify sonar contacts. Also sonar normally tried to determine the range to contacts and that it was normal practice for the sonar supervisor to consult with the FTOW (Firecontrol Technician of the Watch) about contact range. On the day of the accident he had not consulted with the FTOW. He stated that during his watch he had determined the range for S-12 using bearing rate to make the determination and that the range had been about 8,000 yards. He did not attempt to determine a range to S-13, stating that the bearing rate for that contact had been very low. He stated that he believed that S-12 was on a westerly heading and that S-13 was easterly. Throughout his watch up to the time of the accident he stated that he thought the range to S-12 and S-13 was greater than 10,000 yards.

Petty Officer Reyes, who had the first broadband watch after leaving port, stated that he had been relieved as the broadband operator by Petty Officer Bowie about 1140 and had then gone to lunch. After lunch he walked around and said hello to some of the visitors. Then he returned to sonar to get his jacket. He estimated that he arrived back in sonar about 1320. He stated that when he entered sonar, there were about five distinguished visitors present in sonar. He recalled that some time afterwards he heard the announcement about making preparations for going to periscope depth. He believed that the visitors would be distractive to the sonar watch standers and he urged the visitors to leave sonar to observe evolutions in control room, and the visitors left sonar. At this time according to Petty Officer Reyes, angles and dangles had been completed. He stopped to talk with Seaman Rhodes about sonar procedures and about this time Petty Officer McGiboney, the sonar supervisor, requested him to remain in sonar and back up SN Rhodes, who was on the workload share stack, while the ship went to periscope depth.

Petty Officer Reyes believed that all sonar contacts were drawing left. At some point, presumably while assisting seaman Rhodes, he observed indications that S-10 (lost at 1246) was closing and he mentioned this to Petty Officer McGiboney. Petty Officer McGiboney asked Petty Officer Reyes to consult with the FTOW. Petty Officer Reyes stated that the FTOW showed him

that S-10 was on an opening course but that the submarine was overtaking that contact. (During the time that Petty Officer Reyes would have been in sonar, the SLOGGER⁶ data indicated that the FTOW had S-12 and S-13 on opening courses and that S-10 was not being tracked.) (The FTOW recalled talking with Petty Officer Reyes and being informed that sonar thought S-10 was a close contact and that he had adjusted the firecontrol system and found that a close contact situation “would not fit.”) Petty Officer Reyes stated that he had mentioned this to the XO, but the XO did not recall the discussion.

There had been general visiting in sonar from the time the vessel got underway until after lunch. About 1315, most of the visitors had gathered in the control room, to observe high-speed maneuvers involving depth changing (angles and dangles) followed by high-speed turns. At the end of the maneuvers, about 1331, the submarine steadied on course 340° briefly and commenced to reduce speed. Sonar regained S-12 and S-13, which was now bearing approximately 009°. Petty Officer McGiboney still believed that S-12 and S-13 were both distant contacts, possibly 10,000 to 15,000 yards away and posed no threat to the submarine. He stressed that sonar had not observed any cues to suggest that either contact could be close, such as receiving sound on several DEs, hearing engine noise, an increasing signal to noise ratio, obtaining screw blade information, or a high bearing rate from either contact. He recalled that a new contact S-14 was gained either on the tail end of leg (course) 340° or the beginning of the 120° leg. He did not recall reporting S-14 to control to the OOD, but stated that it was something he normally did and he believed he had done so. (The FTOW stated that he recalled hearing Petty Officer McGiboney report the bearing to S-14 to control.)

Petty Officer McGiboney stated that while the submarine was on course 340° that there was no indication on the sonar of any high bearing rate. He stated that a 5° bearing rate for S-13, as subsequently determined from reconstructing the track lines of S-13 (EHIME MARU) and the submarine while it was on course 340°, would be readily noticed on the sonar and that such a high bearing rate would almost “jump off the screen at you”. He mentioned that the high-speed turns had turned the sonar display to “spaghetti” and that time was required to get the sonar picture to settle down. He stated that at the time he thought that the ship had been on 340° for about three minutes, and had learned later that it was about 1.5 minutes.

It was probably during the time that the submarine was on 340°, that the CO visited sonar. However, Petty Officer McGiboney did not recall the CO visiting sonar at this time nor did he recall having any conversation with the CO. He stated any visit by the CO would “not have been a long stay.” He did recall that Petty Officer Reyes came into sonar and that he requested Petty Officer

⁶ Slogger information extracted from the “Reconstruction timeline of USS GREENEVILLE’s Collision” developed by COMSUBPAC, dated 4/20/01.

Reyes to standby to back up Seaman Rhodes while the ship came to periscope depth. He explained that he had not requested Petty Officer Reyes to act as an over-instruction for Seaman Rhodes, only that he felt that another set of eyes would be a good idea when preparing to come to periscope depth. Petty Officer McGiboney recalled that the XO had come into sonar before the submarine executed the baffle clear by changing course from 340° to 120°. He did not recall any conversations with the XO, but he recalled the XO remained in sonar watching the screens until after the ship went to periscope depth. Petty Officer McGiboney stated that he was standing behind the broadband operator, that the XO was standing next to him to his right, and that Petty Officer Reyes was standing on the other side of the XO and was closest to the curtain at the entrance to sonar from the control room. At some time later the XO was standing in the doorway to sonar.

Petty Officer McGiboney stated that normally there is a briefing prior to going to periscope depth but none was conducted on the day of the accident. He stated, that besides discussing the evolutions to be accomplished at periscope depth, such as sending messages, discharging garbage, ventilating the ship, etc. that the briefing normally included a discussion of the tactical situation. He stated that "we will have the CEP plot in front of him [OOD] and we will discuss contacts, where they are, what firecontrol has on a range, if I see any trends that could indicate something." The participants in the briefing normally included the OOD, FTOW, ESM watchstander, Sonar Supervisor, Radio watchstander, Diving Officer, and Chief of the Watch. He stated that he would have reported holding "two contacts to the north" and "my tentative range is about still in the 10,000 yard range." Also he stated that when the various participants were summoned to control for the briefing, it was customary in sonar to turn on some sonar equipment to ascertain the sea state and wind direction, and that that the information was normally available when he returned to sonar following the briefing, and that he would report the sea state information to the OOD at that time. Because there was no briefing he had not thought to turn on the equipment to acquire the sea state information for the OOD, and that it had not been requested by the OOD.

Petty Officer McGiboney stated that he recalled hearing the OOD report no close contacts and then the submarine going to a shallower depth apparently for a higher look. Then a short time later the submarine executed an emergency deep evolution, which took the submarine to 400 feet. He stated that he knew there was going to be an emergency ballast tank blow, and that the air noise would interfere with sonar reception. Soon after the air was released for the emergency ballast tank blow, he recalled hearing the CO announce on the 1MC that the bow was out and that the distinguished visitors would be feeling a change in gravity as the bow came down. About this time he heard a noise, and as the vessel leveled out he heard a second noise, which appeared to be aft. Petty Officer McGiboney recognized that the submarine had collided with some vessel, which he believed must have been emitting no noise. This belief was to

some extent confirmed in his mind by the presence of three traces on the sonar screen, which he believed were the three contacts (S-12, S-13, and S-14) that sonar had been tracking before the collision. The other sonar supervisor appeared in sonar to relieve Petty Officer McGiboney. Petty Officer McGiboney stated that as soon as the three contacts were being tracked in automatic that he was relieved as sonar supervisor. Following his relief, he assume the duties of First Lieutenant, which involved getting emergency equipment broke out for search and rescue and standing by to open the forward escape hatch if directed to do so.

When he returned to sonar, he recalled that the EHMIE MARUE was sinking under the water and that it had been designated S-16.

A few days after the accident Petty Officer McGiboney learned that S-13 had been identified as the EHIME MARU.

Table No1.

Sonar Contacts

S-10

<u>Time(GMT/Local)</u>	<u>Bearing</u>
2140/1140	262°
2142/1142	263°
2203/1203	296°
2225/1225	247°
2235/1235	228°
2242/1242	202°
2246/1246	174°

S-11

2149/1149	116°
2205/1205	114°
2213/1213	114°

S-12

2230/1230	332°
2235/1235	318°
2256/1256	328°
2311/1311	334°
2312/1312	322°
2325/1325	320°
2341/1341	313°
2341/1341	313°
(accident)	
2357/1357	318°

S-13

2232/1232	357°
2233/1233	357°
2235/1235	359°
2240/1240	359°
2242/1242	359° Faded
2256/1256	001° Regained
2312/1312	007°
2325/1325	009° Faded
2328/1328	004° Regained
2330/2330	008°
2332/1332	008°
2348/1348	Collision

S-14

2332/1332	358
2341/1341	339
2350/1350	350

H. FIRECONTROL

Background -- Petty Officer Seacrest, age 32, had been in the Navy for 14 years and all of his sea service had been in nuclear submarines. At the time of the accident he had served in four submarines, including the *GREENEVILLE*. He was qualified in submarines and regularly stood watch as firecontrol technician of the watch (FTOW). He was also qualified to stand watch as chief of the watch, a part of the ship-control party, when underway. Onboard the *GREENEVILLE* he was the leading petty officer under a Chief Petty Officer.

While on board his first submarine, he had chosen and had been permitted to strike for the firecontrol technician rating. At this time his training in firecontrol was on-the-job training, but during his third year in the Navy he was sent to Class A Firecontrol School, the basic technical training for the firecontrol technician rating. Upon completing Class A School he was ordered to his second submarine. Petty Officer Seacrest stated that he had been involved in operating firecontrol equipment for 9 of his 14 years in submarines. He had received additional operator training at two 2-week-long operator schools, one in 1989 and one in 1993, and that he had received considerable training in operating firecontrol equipment at shore side training facilities. He stated that he felt very confident in operating the firecontrol equipment on the *GREENEVILLE*. Petty Officer Seacrest stated that he was well rested on February 9, and that he was in good health and was not taking any medications.

He had earned the NAVY AND MARINE CORPS ACHIEVEMENT MEDAL on three separate occasions. Personnel records available on the USS *GREENEVILLE* showed that he earned this medal a second time in October 2, 1999 while serving in the submarine *USS BUFFALO* (SSN-715) and on January 28, 2000 while serving in the *USS GREENEVILLE* (SSN-772) and that on each of these two occasions he was awarded a Gold Star in lieu of the medal. The citations stated that the awards were earned for superior performance as a firecontrol technician. The two *Evaluation Report and Counseling Records* available from the USS Buffalo for periods from February 13, 1999 to September 4, 1999 and September 5, 1999 to March 31, 2000 and the one from the USS *GREENEVILLE* for the period of March 21 to November 15, 2000 indicated that Petty Officer Seacrest was a very able firecontrol technician who met or exceed standards. The text in these performance appraisals cited his expertise in operating the firecontrol equipment and technical expertise in maintenance of that equipment. Laudatory language in each appraisal cited his leadership and mentoring in promoting the effectiveness of those in the firecontrol division. The Commanding Officer (CO) and Executive Officer (XO) both praised Petty Officer Seacrest for his efforts as a career counselor on board the *GREENEVILLE*. The XO stated that the career counseling efforts by Petty Officer Seacrest had contributed to the high reenlistment rate achieved by the *GREENEVILLE*. The CO testified that he was a very effective firecontrolman, even superior in performance to the Chief Petty Officer.

February 9, 2001, Petty Officer Seacrest stated that he arrived on board the *GREENEVILLE* around 0500 and checked to make sure his equipment was operating and then went to quarters for muster of the crew, which was held at 0500. After quarters he was involved in letting go the mooring lines. After the vessel got underway and he was released from line handling duties, he met with the other two firecontrol technicians on board to go over what they would be doing that day. The other firecontrol technicians, including the Chief Petty Officer, had remained in port. After his meeting with the two firecontrol technicians, he was off watch until after the noon meal and then went on watch about 1130 as the firecontrol technician of the watch (FTOW). About 1200, he was relieved by one of the other firecontrol technician for about ten minutes so that he could take a smoke break.

Petty Officer Seacrest stated that when Sonar acquires a contact, Sonar classifies the contact as to the possible type of vessel and assigns a designation to the contact such as Sierra (S), to indicate it is a sonar contact followed by a number such as 1, 2, etc. depending on the consecutive number of the sonar contact acquired that day. Then bearings to the contact are normally sent automatically to his firecontrol computer system. It then becomes the FTOW's responsibility to ascertain the course, speed, and range of each sonar contact using the firecontrol system. He stated that it was normal practice for the sonar supervisor and FTOW to confer with each other about the contacts such as possible range and other factors. However, during transits like that on February 9, 2001, such consultation did not normally occur and he could not recall any such consultation with the sonar supervisor, but he did recall talking to Petty Officer Reyes about S-10. He stated that he had three contacts and that three contacts was a very light load for him to track with the firecontrol system. He estimated that he could track a dozen contacts.

He stated that when a contact was gained, that it was standard procedure to enter the contact in the firecontrol system with a small angle on the bow, i.e., a small bow-on aspect that would place the contact on a closing course. Then he, as the FTOW, would vary the parameters of course and speed and range settings in the firecontrol system to develop a solution that would be consistent with the incoming bearings from sonar. He stated that operating own ship on two legs for approximately three minutes was usually sufficient to verify and refine the solution for contact course and speed and especially range. Each leg would need to be 60° or more either direction from the line of bearing to the contact and ideally ship's speed would need to be about 12 knots. He stressed that he had no confidence in a solution based on a single leg. He stated that he only changed the course of the contact from a closing course to an opening course when he was convinced that the contact was opening. He stated that he was sometimes aided by sonar in determining whether a contact was opening or closing.

Petty Officer Seacrest stated that when Sierra 13 was first gained (about 1233), he initially set a solution in the firecontrol system comprising a range of about 10,000 yards, a speed of ten knots, and on a closing course. He stated that he could not recall if he used a starboard or port angle on the bow, only that he had selected a closing course, which was either zero or a small angle like 5°.

At time 1242:15 when S-13 was regained following a baffle clear, the SLOGGER data showed that the FTOW had a solution in the fire control computer for S-13 which had the contact on course 170° at speed 4 knots and at a range of 6000 yards. At this time the actual range was about 35,400 yards. About three minutes later at 1255:30 the FTOW had the same solution; however, the actual range by this time was about 30,000 yards. By time 1310:01 the FTOW had set a solution in his computer that placed S-13 on an opening course of 010° at speed 11 knots and at a range of 8,000 yards. At this time the actual range was 20,600 yards. A few minutes later at 1314:02, the FTOW altered the solution to put S-13 on course 024° still at speed 11 knots and at a range of 15,000 yards. The actual range was 18,000 yards.

About 1300, the distinguished visitors commenced gathering in the control room to observe the vessel maneuvers that had been scheduled as part of their underway indoctrination. The maneuvers were to consist of “angles and dangles”, which involved changing depths using high speeds and angles up to 20°, followed by high speed turns involving speeds of about 25 knots. These maneuvers were intended to demonstrate how the submarine could maneuver to evade other vessels. The maneuvers commenced about 1315. Petty Officer Seacrest recalled that at the start of the angles and dangles, sonar held three contacts, S-10, -12 and -13, and that he was tracking these contacts in his firecontrol system. However, he stated that he did not recall the course or speed of the contacts. He believed the range to the contacts was about 8,000 to 10,000 yards. He stated that during the high-speed maneuvers, sonar was not able to maintain continuous contact on the three contacts.

At this time the four firecontrol screens were set up from forward to aft as follows: (1) line-of-sight, (2) time-bearing, (3) Flit mate and (4) op-summary.⁷

⁷ Line-of Sight was a vector presentation with the bearing appearing as a vertical line and the contact shown as a vector at the top of the screen and own ship shown as a vector at the bottom of the screen. The vertical bearing line intersects both own ship and contact vectors. Time bearing was an electronic plot of contact bearing plotted against time. Flit mate (Frequency Linear Integration Tracker) is a means of comparing incoming sonar bearings, shown as dots, that can be compared with the bearing being generated by the firecontrol computer for the parameters of course, speed, and range in the computer. The incoming dots appear above the previous dots to form a line of dots. The firecontrol technician varies course, speed and range settings in the firecontrol computer to eliminate any difference between the generated bearings and the actual bearings coming from sonar to achieve a tracking solution. The Op-Summary is a polar coordinate plot, where lines radiating from the center of the plot indicate bearing from own ship, and range is indicated by the distance from the center of the plot. Contact location is shown by a

Petty Officer Seacrest was seated in the third seat in front of the Flit mate presentation.

One of the other two firecontrol technicians was seated nearby at the TAC-3 console reading a technical manual. The TAC-3, a separate independent firecontrol system, was energized and was capable of duplicating the firecontrol system, but the off-watch firecontrol technician not been tasked to make use of it or to assist the FTOW in any way.

One of the duties of the FTOW was maintaining the Combat Evaluation Plot (CEP), a paper plot showing zero to 360° horizontally and time along the vertical axis. As time progressed the graph paper used for the plot was unrolled from a roll of paper. It was customary to manually annotate the CEP to indicate the submarine's heading, and to record the bearings from sonar, ESM, and any visual observations every 15 minutes. The CEP provided a hard copy presentation of the history of own vessel movements and corresponding contact information. Petty Officer Seacrest stated that it was very crowded in the control room and that when he attempted to reach the CEP he interfered with the visitors who were then holding on to various fittings adjacent to the conning station to maintain their balance during the changing angles, so he decided to discontinue maintaining the plot. He stated that he did not request permission to secure the CEP, or inform the officer of the deck or any other officer that he had stopped plotting data on the CEP. Nor did he consider asking the firecontrol technician sitting at the TAC-3 to maintain the CEP. He also stated that neither the OOD, CO, nor XO made any comments to him about the fact that the CEP was not being maintained.

At the end of the high-speed maneuvers, about 1330, the ship was steadied briefly on course 340° and speed was reduced. Following the maneuvers, Petty Officer Seacrest recalled that S-12 and -13 were again regained and were being tracked, but that sonar no longer held S-10. At this time, he still believed that S-13 was a distant contact and posed no threat. Although he had initially entered S-13 on a closing course, data recorded by the sonar data recorder (SLOGGER) later revealed that the firecontrol system had S-13 on an opening course of 024° for much of the time before going to periscope depth. The contact had actually been steady on course 166° for the entire time. and its range was decreasing. Petty Officer Seacrest stated that he did not recall entering the opening course of 024° into the firecontrol system nor did he recall that the system had this course for S-13.

According to Petty Officer Seacrest, at some time after the high-speed maneuvers, he recalled the CO coming out of sonar. (It is estimated that the CO walked out of sonar at approximately 1332.) He also recalled that shortly before

dot on the respective bearing line at a distance from the center corresponding to range from own ship. Vectors at each contact location indicate the course and speed of the contact.

the ship proceeded to periscope depth, the CO announced that he had a good feel for the contacts. Petty Officer Seacrest stated that he did not recall having any conversation with the CO, OOD or XO regarding the firecontrol solutions for the contacts that he was tracking, but he acknowledged that they might have looked at the firecontrol screens while standing behind him without him being aware of it. He stated that the OODs frequently consulted with him, but that the CO rarely did so.

About 1332, after approximately 1.5 minutes on course 340°, the submarine's course was changed to 120° to clear the baffles, a maneuver where the submarine changes course to listen to the large null area that had been astern of the vessel. About this time sonar gained S-14. Petty Officer Seacrest stated that he gave priority to analyzing S-14 because it was a new contact.

Approximately 1335, the OOD announced on the 1MC, the ship's public address system, to prepare to go to periscope depth, and he ordered sonar to report all contacts. Petty Officer Seacrest stated that he recalled the Sonar Supervisor reporting the contacts that sonar held at that time and that they included S-14. According to Petty Officer Seacrest, he did not yet have sufficient data for a good firecontrol solution for course, speed, and range of S-14, because he had only one leg of data on that contact. The fact that the sonar announcement included S-14 reassured him that the CO was aware of S-14 and was satisfied that it posed no threat. He stated that he quickly updated the solutions for the contacts that he was tracking, including S-12, S-13 and S-14, but could not recall what courses, speeds, or ranges resulted from his up-dating and he stated that he believed he had not actually noted the courses, speeds, and ranges resulting from his analysis. He described his updating as rushed, and he stated that he was still updating his contacts as the submarine proceeded to periscope depth and that he continued to give priority to analyzing S-14. Petty Officer Seacrest stated that while the ship proceeded to periscope depth he also monitored the three contacts on the time/bearing presentation of the firecontrol system because any fast bearing rate indicative of a close contact would be more likely detected on that particular screen.

The XO stated that Petty Officer Seacrest had little time to update the solutions in the firecontrol system before going to periscope depth and that he may have felt it necessary to update the solutions so that the results of his analysis could be observed by the OOD and CO. Thus, he might not have noted the resulting courses, speeds or ranges.

Data recorded by the sonar data recorder (SLOGGER) revealed that the firecontrol system had S-13 on an opening course of 024° for much of the time before going to periscope depth, although its actual course was 166°. Petty Officer Seacrest stated that he did not recall entering the 024° course into the firecontrol system nor did he recall that the system had this course for S-13. Petty Officer Seacrest did not recognize that the overall bearing change for S-13

was to the right. He stated his belief that when the ship went to periscope depth the bearings to all three contacts were drawing left. The SLOGGER data revealed that the bearing to S-13 was actually nearly steady while the vessel was on course 120° and that the range was decreasing.

About 1337, the CO ordered the OOD to proceed to periscope depth, and the OOD ordered the diving officer to proceed to 60 feet. At that time the ship was at 150 feet. When the ship arrived at periscope depth, the OOD conducted the normal quick periscope search at a depth of 60 feet and announced “no close contacts” Then the CO took the periscope and commenced a visual search and ordered a higher depth to increase the periscope height of eye. The OOD ordered the submarine depth changed to 58 feet. When the periscope projected above the water, Petty Officer Seacrest shifted his attention to the PERIVIS monitor near his firecontrol station.

About the time the ship was proceeding to periscope depth, the fire control computer developed a solution for S-13 which placed that contact at about 2,400 yards away on a course of 141° at speed 8 knots. (Previous solutions based on an opening course of 024° at 11 knots and had resulted in solutions where the range was 16,000 yards.) Petty Officer Seacrest did not report the large decrease in range to the OOD or CO.

Petty Officer Seacrest stated that he did not ask the CO to check the sonar bearings, but that he did observe the OSDS⁸ and noted that the CO was looking down the bearings of the sonar contacts. The CO did not ask to be coached onto the precise bearings of the sonar contacts. A few moments later at 1340, the CO ordered “emergency deep.” As the submarine proceeded down according to Petty Officer Seacrest, he noted that there was a solution in the fire control system for S-13 that placed that contact about 3000 yards from the submarine. Petty Officer Seacrest stated that he increased the range to 9000 yards based on the fact that the CO had just completed a visual search and that this indicated that no contacts could be that close. However, data recorded on the SLOGGER indicated that the collision occurred at 1343, and that the increase in range to S-13 had been entered into the firecontrol system 15-30 seconds after the collision. Petty Officer Seacrest stated that he recalled making the increase in range before the collision and could not explain why the SLOGGER data could indicate a time after the collision.

Petty Officer Seacrest stated that he recalled the emergency surface followed by two different bangs. He recalled that the first was a “loud bang” and was followed by a “not-so-loud bang” that “sounded further away.” He immediately went to sonar to find out if they had collided with one of the contacts held on sonar. The sonar supervisor pointed out that sonar still had three traces

⁸ The Own Ship's Display System, commonly referred to as OSDS, enables bearing information to be received from various sources such as either of the periscopes. It must be manually set to the particular source of bearing information.

on the sonar screen suggesting to the sonar supervisor that the collision had occurred with a vessel that had not been held by sonar.

Petty Officer Seacrest later stated that he might have “done stuff a little slower,” but “at the time every thing was going the way” presumably he expected or that seemed normal. He stressed that the presence of the passengers did not affect his performance.

I. TOXOCOLGY

EHIME MARU - Toxicological Testing – The Coast Guard tested the Master for alcohol at 1730 on February 9, 2002 by the Coast Guard after the EHIME MARU crew had been picked up from their liferafts and returned to port by the Coast Guard. The results of the alcohol test were negative. At this time a urine sample was collected by Tim Holman of SAFETEC, a contract collector retained by the Coast Guard. The two unlicensed sailors on watch at the time of the accident provided urine samples at 0930 on Saturday February 10, 2001, also collected by Tim Holman of SAFETEC. The urine samples were tested for the following standard 5 illicit drugs specified in Department of Transportation regulations: Marijuana, Cocaine, Amphetamines, Opiates and PCP. All tests were negative.

USS GREENEVILLE Toxicology Testing - The Navy, at the request of US Coast Guard Marine Safety Office Honolulu, conducted drug testing of 25 crewmembers of the USS Greeneville, who were at various watch stations. The testing was conducted by the Navy Drug Lab, San Diego, California. In addition to the 5 illicit drugs specified in the Department of Transportation regulations, the Navy routinely tests for Barbiturates and LSD; these additional tests were conducted in this case. All results were negative. No alcohol testing was conducted because the GREENEVILLE remained at sea during the night of February 9, well beyond the maximum 8 hours.

W. R. Woody
Human Performance Investigator

Enclosure:

“Reconstruction timeline of USS GREENEVILLE’s Collision” developed by COMSUBPAC, dated 4/20/01.

Time (W)	Human Dynamics	Sensors	Fire Control Solutions	Reconstructed Reality
12:28:59	Commence tracking Sierra 12.	Gain Sierra 12: B-331.2		SSN: On C-000, S-10 kts, D-650 ft
12:30:32				SSN: Proceeds up to D-400 ft
12:31:59	Commence tracking Sierra 13.	Gain Sierra 13: B-356.8		EHIME MARU (EM): B-358, R-39,600 yds & closing, C-166, S-4 kts, AOB-S12
12:33:39				SSN: Reaches D-400 ft
12:34:40				SSN: Proceeds down to D-650 ft
12:37:56				SSN: Reaches D-650 ft
12:39:50	Commence baffle clear to the left.			SSN: Comes left to C-240
12:42:15	Drop track on Sierra 13. Sierra 13 enters starboard baffle due to change in course to 240.	Fade Sierra 13: B-359.1	Sierra 13: B-004, R-6000 yds & opening 9 yds/min, C-170, S-4 kts, AOB-S14	EM: B-359, R-35,400 yds & closing, C-166, S-4 kts, AOB-S13
12:42:34	Complete baffle clear.			SSN: Steady on C-240
12:45:00				SSN: Comes right to C-000
12:45:04				SSN: Proceeds up to D-400 ft
12:45:45	Last time held Sierra 10.	Fade Sierra 10: B-175.6 out of ATF as contact approaches port baffle	Sierra 10: B-192, R-4,000 yds & opening 152 yds/min, C-040, S-4 kts, AOB-S27	

12:47:45				SSN: Steady on C-000
12:50:00	Approximate time that Ehime Maru completes stowing anchor and increases speed to 11 kts.			
12:50:28				SSN: Reaches D-400 ft
12:51:44				SSN: Proceeds down to D-650 ft
12:54:25				SSN: Reaches D-650 ft
12:55:30		Regain Sierra 13: B-001.9	Sierra 13: B-004, R-6,000 yds & opening 9 yds/min, C-170, S-4 kts, AOB-S14	EM: B-002, R-30,200 yds & closing, C-166, S-11 kts, AOB-S16
13:04:46				SSN: Comes right to C-020
13:06:20	Approximate time XO advises CO that ship needs to start afternoon demonstrations based upon time scheduled to be at Papa Hotel.			SSN: Steady on C-020
13:10:01		Sierra 12: B-322.9, Drwg Left	Sierra 12: B-323, R-11,000 yds & opening 242 yds/min, C-343, S-13 kts, AOB-S160	SSN: C-020, S-10 kts, D-650 ft
"		Sierra 13: B-006.9, Brg Steady	Sierra 13: B-004, R-8,000 yds & opening 60 yds/min, C-010, S-11 kts, AOB-S174	EM: B-006, R-20,600 yds & closing, C-166, S-11 kts, AOB-S20
13:14:02	Approximate time of CO's first Sonar walk-through - observed two contacts (Sierras 12 and 13) to the north and northwest.	Sierra 12: B-321.5, Drwg Left	Sierra 12: B-322, R-12,000 yds & opening 239 yds/min, C-345, S-13 kts, AOB-S157	
"		Sierra 13: B-007.5, Drwg Right	Sierra 13: B-007, R-15,000 yds & opening 30 yds/min, C-024, S-11 kts, AOB-S163	EM: B-007, R-18,000 yds & closing, C-166, S-11 kts, AOB-S21

13:15:35	Commence angles.	Sierra 13: B-007.2, Brg Steady	Sierra 13: B-007, R-15,000 yds & opening 29 yds/min, C-024, S-11 kts, AOB-S163	EM: B-007, R-16,800 yds & closing, C-166, S-11 kts, AOB-S21
"				SSN: Commences depth changes (650-150 ft) at 12-14 kts
13:17:01		Sierra 12: B-319.9, Drwg Left	Sierra 12: B-320, R-14,000 yds & opening 212 yds/min, C-343, S-14 kts, AOB-S158	
"	Fire control system solution range rate "closing" only because SSN is overtaking Sierra 13 (EM); EM believed to be on "opening" course.	Sierra 13: B-006.9, Brg Steady	Sierra 13: B-008, R-15,000 yds & closing 73 yds/min, C-024, S-11 kts, AOB-S163	EM: B-008, R-16,000 yds & closing, C-166, S-11 kts, AOB-S22
"				SSN: Comes left to C-000
13:23:03		Sierra 12: B-318.9, Drwg Left	Sierra 12: B-318, R-15,000 yds & opening 118 yds/min, C-343, S-14 kts, AOB-S155	
"	Fire control system solution range rate "closing" only because SSN is overtaking Sierra 13 (EM); EM believed to be on "opening" course.	Sierra 13: B-010.9, Drwg Right	Sierra 13: B-011, R-15,000 yds & closing 52 yds/min, C-024, S-11 kts, AOB-S167	EM: B-013, R-11,400 yds & closing, C-166, S-11 kts, AOB-S27
13:23:10	Complete angles. Setting up for high speed maneuvers (HSMs).			EM: B-013, R-11,200 yds & closing, C-166, S-11 kts, AOB-S27
"	Approximate time XO again reminds CO of time and distance to Papa Hotel.			SSN: Proceeds up to D-400 ft, increases speed to >25 kts for high speed maneuvers
13:25:02	Commence HSMs after reaching D-400 ft and with change in course to 140.	Fade Sierra 12: B-318.8, as contact enters port baffles	Sierra 12: B-315, R-15,000 yds & opening 266 yds/min, C-343, S-14 kts, AOB-S153	SSN: Coming right to C-140
"	Fire control system solution range rate "closing" only because SSN is overtaking Sierra 13 (EM); EM believed to be on "opening" course.	Fade Sierra 13: B-007.8, out of ATF as contact approaches port baffles	Sierra 13: B-013, R-14,000 yds & closing 576 yds/min, C-024, S-11 kts, AOB-S169	EM: B-017, R-9,400 yds & closing, C-166, S-11 kts, AOB-S31
13:26:27				SSN: Steady on C-140

13:26:43				SSN: Comes left to C-340
13:28:04				SSN: Steady on C-340, S > 25 kts
13:28:17		Regain Sierra 13: B-004.6, back in ATF after steady on C-340		EM: B-015, R-7,400 yds & closing, C-166, S-11 kts, AOB-S29
13:28:57				SSN: Comes right to C-120, commences slowing to 12 kts
13:29:47		Fade Sierra 13: B-346.1, Drwg Left, out of ATF as contact approaches port baffles	Sierra 13: B-009, R-14,000 yds & opening 549 yds/min, C-024, S-11 kts, AOB-S169	SSN: Steady on C-120, S >25 kts
"				EM: B-017, R-6,000 yds & closing, C-166, S-11 kts, AOB-S31
13:30:42	Complete HSMs.			EM: B-011, R-6,000 yds & closing, C-166, S-11 kts, AOB-S25
"				SSN: Begins slowing to S-11 kts and comes left to C-340
13:31:33		Regain Sierra 13: B-014.6, Drwg Left, back in ATF as own ship turns back to northerly course	Sierra 13: B-009, R-14,000 yds & opening 577 yds/min, C-024 S-11 kts, AOB-165	EM: B-010, R-5,400 yds & closing, C-166, S-11 kts, AOB-S24
13:31:36				SSN: Steady on C-340, S-19 kts and slowing, proceeds up to D-150 ft
13:32:03	Approximate time of CO's second Sonar walk-through.	Regain Sierra 12: B-316.6		
13:32:48	Fire control system solution range rate "closing" only because SSN is overtaking Sierra 13 (EM); EM believed to be on "opening" course.	Sierra 13: B-016.3, Drwg Right	Sierra 13: B-007, R-15,000 yds & closing 72 yds/min, C-024, S-11 kts, AOB-S163	EM: B-017, R-4,400 yds & closing, C-166, S-11 kts, AOB-S31

13:32:54	Total time steady on C-340, speed 13.5 kts or less and depth 150-170 ft is not more than 20 seconds. Total time on C-340, speed 18 kts or less and depth 150-400 ft (above Layer Depth) is 91 seconds.			SSN: Reaches D-150 ft, S-12.7 kts & slowing
13:33:03	CO orders OOD to clear baffles to course 120.	Sierra 12: B-312.5, Drwg Left	Sierra 12: B-311, R-18,000 yds & opening 26 yds/min, C-343, S-14 kts, AOB-S149	SSN: On C-340, S-13 kts, D-150 ft
"	Fire control system solution range rate "closing" only because SSN is overtaking Sierra 13 (EM); EM believed to be on "opening" course.	Sierra 13: B-017.5, Drwg Right, tracking well with SNR +9 dB	Sierra 13: B-008, R-15,000 yds & closing 23 yds/min, C-024, S-11 kts, AOB-S164	EM: B-018, R-4,200 yds & closing, C-166, S-11 kts, AOB-S32
"	Sonar Supervisor gains Sierra 14 as new contact. Sonar currently holds three contacts (Sierras 12, 13 and 14).	Gained Sierra 14: B-002.5		
13:33:07	Clearing baffles to the right.			SSN: Comes right to C-120. This will be first leg of TMA for Sierra 14.
13:34:00	Approximate time that CO explains over 1MC that the purpose of baffle clear before going to P/D is to prevent collision at P/D.			
13:34:03	Initial solution for Sierra 14 is based upon one minute of data.	Sierra 14: B-356.7, Brg Steady	Sierra 14: B-358, R-8,000 yds & closing 597 yds/min, C-195, S-12 kts, AOB-S17	
13:34:48	Sonar currently holds two contacts (Sierras 13 and 14).	Fade Sierra 12: B-316.5	Sierra 12: B-311, R-19,000 yds & opening 593 yds/min, C-343, S-14 kts, AOB-S149	
"	Significant bearing error developing between fire control system solution and sensor bearing.	Sierra 13: B-021.5, Drwg Right	Sierra 13: B-008, R-15,000 yds & opening 303 yds/min, C-024, S-11 kts, AOB-S164	EM: B-023, R-3,200 yds & closing, C-166, S-11 kts, AOB-S37
"	Sierra 14 solution updated second time indicating that FTOW is focused on developing a good initial solution on new contact Sierra 14.	Sierra 14: B-357.5, Brg Steady	Sierra 14: B-356, R-11,000 yds & opening 402 yds/min, C-337, S-12 kts, AOB-P160	

13:35:39	Approximate time OOD orders Sonar, "Report all contacts."			SSN: Steady on C-120, D-150 ft, S-7.5 kts
13:35:48	Approximate time Sonar Supervisor reports all contacts including new contact Sierra 14. CO misses hearing report of Sierra 14 from Sonar Supervisor.	Sierra 13: B-020.5, Brg Steady	Sierra 13: B-008, R-15,000 yds & opening 452 yds/min, C-024, S-11 kts, AOB-S164	EM: B-022, R-2,800 yds & closing, C-166, S-11 kts, AOB-S36
13:35:49 - 13:36:44	CO says he has a good feel for contact picture (he believes that the two contacts held by sonar are Sierras 12 & 13 since he is unaware of new contact Sierra 14 and that Sierra 12 has faded).			
13:36:45	Approximate time CO orders ship to P/D.	Sierra 13: B-021.2, Brg Steady	Sierra 13: B-007, R-16,000 yds & opening 448 yds/min, C-024, S-11 kts, AOB-S163	EM: B-022, R-2,600 yds & closing, C-166, S-11 kts, AOB-S36
"		Sierra 14: B-356.2, Brg Steady	Sierra 14: B-352, R-10,000 yds & closing 231 yds/min, C-197, S-12 kts, AOB-P24	
13:36:58	Total time steady on C-120, S-7.5 kts, D-150 ft is 86 seconds. FTOW surprised by CO ordering ship to P/D because there is only one leg of data for Sierra 14.			SSN: Starts ascent to periscope depth; ordered depth is 60 ft
13:37:03		Sierra 13: B-020.2, Brg Steady	Sierra 13: B-007 R-16,000 yds & opening 446 yds/min, C-024. S-11 kts, AOB-S163	EM: B-022, R-2,600 yds & closing, C-166, S-11 kts, AOB-S36
13:37:18		Sierra 13: B-020.1, Brg Steady	Sierra 13: B-007 R-16,000 yds & opening 449 yds/min, C-024, S-11 kts, AOB-S163	EM: B-022, R-2,600 yds & closing, C-166, S-11 kts, AOB-S36

13:37:48	Fire control system solution is updated to a closing solution as the submarine ascends to P/D. No repot is made by the FTOW to the OOD who is on the periscope, or to the CO who is on the Conn. Updated fire control system solution is reasonable.	Sierra 13: B-020.7, Brg Steady	Sierra 13: B-021, R-4,000 yds & closing 105 yds/min, C-141, S-8 kts, AOB-S61	EM: B-021, R-2,400 yds & closing, C-166, S-11 kts, AOB-S35
"	FTOW is still focused on Sierra 14. Sierra 14 continues to draw into port baffle resulting in unreliable track of Sierra 14.	Sierra 14: B-355.7, Brg Steady	Sierra 14: B-350, R-10,000 yds & closing 221 yds/min, C-197, S-12 kts, AOB-P26	
13:38:40				SSN: At periscope depth
"		Sierra 13: B-019.8, Brg Steady	Sierra 13: B-022, R-3,000 yds & closing 115 yds/min, C-141, S-8 kts, AOB-S61	EM: B-021, R-2,200 yds & closing, C-166, S-11 kts, AOB-S35
13:39:04	Approximate time OOD reports "no close contacts" based upon three rapid 360 degree searches.	Sierra 13: B-020.6, Brg Steady	Sierra 13: B-022, R-3,000 yds & closing 110 yds/min, C-141, S-8 kts, AOB-S61	EM: B-021, R-2,000 yds & closing, C-166, S-11 kts, AOB-S35
"	Approximate time CO takes scope from OOD, begins 360 degree search and orders ship to 58 ft. Following 360 search, conducts high power sector search in the area that includes Sierras 12 and 13.	Sierra 14: B-355.6, Brg Steady	Sierra 14: B-347, R-10,000 yds & closing 197 yds/min, C-197, S-12 kts, AOB-P29	
13:39:30	CO continues periscope search.	Sierra 13: B-020.9, Brg Steady	Sierra 13: B-022, R-3,000 yds & closing 104 yds/min, C-141, S-8 kts, AOB-S61	EM: B-021, R-2,000 yds & closing, C-166, S-11 kts, AOB-S35
"				SSN: Reaches depth 58 ft.
13:39:35				SSN: Attains 57 ft (minimum depth)

13:39:46	Initiation of Emergency Deep. This completes CO's periscope search. Total time at P/D is 66 seconds. Total time at approximately 58 ft is 16 seconds.	Sierra 13: B-019.6, Drwg Left	Sierra 13: B-022, R-3,000 yds & closing 105 yds/min, C-141, S-8 kts, AOB-S62	EM: B-021, R-1,800 yds & closing, C-166, S-11 kts, AOB-S36
"				SSN: Commences Emergency Deep, departs periscope depth
13:39:50	Approximate time CO asks for direction to Papa Hotel, ANAV responds 340.			SSN: C-121 , S-6.4 kts, D-64 ft
13:40:03		Sierra 13: B-019.4, Drwg Left	Sierra 13: B-022, R-3,000 yds & closing 95 yds/min, C-141, S-8 kts, AOB-S62	EM: B-021, R-1,800 yds & closing, C-166, S-11 kts, AOB-S35
"				SSN: C-120 , S-8.6 kts, D-79 ft
13:40:34		Sierra 14: Tracks off, then fades B-340.9		SSN: Comes left to C-340, S-12.8 kts, D-179 ft
13:41:57				SSN: Reaches 400 ft, C-038, S-13.3 kts
13:42:03	Significant bearing error developing between fire control system solution and sensor bearing due to range error in system solution.	Sierra 13: B-007.4, Drwg Left	Sierra 13: B-020, R-3,000 yds & closing 577 yds/min, C-141, S-8 kts, AOB-S59	EM: B-007, R-1000 yds & closing, C-166, S-11 kts, AOB-S21
				SSN: C-035 , S-13.2 kts, D-402 ft
13:42:25	Approximate time CO announces on 1MC expected response of ship to initiation of EMBT blow.			SSN: Initiates emergency MBT blow (Hdg 027 & swinging left at 0.3 deg/sec). Rudder amidships.
13:43:15	Approximate time SSN hull collides with EM.			SSN: Hull collides with EM (SSN Hdg 019, S-14.1 kts, Vert Vel 9.5 ft/sec).
13:43:48	Approximate time CO raises scope and observes EM astern.	Sierra 13: B-310.9, Drwg Left	Sierra 13: B-324, R-9,000 yds & opening 46 yds/min, C-240, S-99 kts, AOB-P94	EM: Astern of SSN (no track data)

13:44:49	Neither SSN nor EM reported visual sighting of any contacts after collision.	Regain Sierra 14: B-348.1	Sierra 14: B-343, R-9,000 yds & closing 79 yds/min, C-197, S-12 kts, AOB-P33	
		nearest tenth of a degree	Note: Bearing - recorded to the nearest degree, Range - recorded to the nearest 1000 yds, Course - recorded to the nearest degree, Speed - recorded to the nearest knot	Note: Bearing - recorded to the nearest degree, Range - recorded to the nearest 200 yds, Course - recorded to the nearest degree, Speed - recorded to the nearest tenth of a knot